Claims

We claim:

1. A radiation shielding integrated circuit device comprising:

a plurality of package layers comprising:

a circuit package;

a radiation shielding base coupled to the circuit package; and

a circuit die coupled to the radiation shielding base; and

a radiation shielding lid coupled to the plurality of package layers;

wherein the circuit die are shielded from receiving an amount of radiation greater than the total dose tolerance of the circuit die;

wherein the plurality of package layers are stacked on top of each other such that a bottom of a first package layer acts as a top of a second package layer.

2. The radiation shielding integrated circuit device of claim 1 further comprising:

a substrate coupled to the radiation shielding base; and

a plurality of circuit die coupled to the substrate.

3. The radiation shielding integrated circuit device of claim 2 further comprising a plurality of thermal vias in the substrate coupling the plurality of circuit die to the radiation shielding base.

4. The radiation shielding integrated circuit device of claim 2 further comprising a thermal connection between the plurality of package layers coupling a first of the plurality of radiation shielding bases to a second of the plurality of radiation shielding bases.

5. The radiation shielding integrated circuit device of claim 2 wherein a first of the plurality of radiation shielding bases acts as a heat sink for the radiation shielding integrated circuit device.

6. The radiation shielding integrated circuit device of claim 1 wherein the plurality of package layers are attached with one of solder balls and screened on solder paste.

7. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding lid is a high Z material.

8. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding base is a high Z material.

9. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding base acts as a heat sink.

10. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding lid comprises a high Z material and a low Z material.

11. The radiation shielding integrated circuit device of claim 1 wherein the radiation shielding base comprises a high Z material and a low Z material.

12. A radiation shielding integrated circuit device comprising:

a plurality of package layers comprising:

a circuit package;

a radiation shielding lid coupled to the circuit package; and

a circuit die coupled to the circuit package; and

a radiation shielding base coupled to the plurality of package layers; and

wherein the circuit die are shielded from receiving an amount of radiation greater than the total dose tolerance of the circuit die;

wherein the plurality of package layers are stacked on top of each other.

13. The radiation shielding integrated circuit device of claim 12 further comprising:

a substrate coupled to the circuit package; and

a plurality of circuit die coupled to the substrate.

14. The radiation shielding integrated circuit device of claim 13 further comprising a plurality of solder balls connecting the substrate to the circuit package.

15. The radiation shielding integrated circuit device of claim 12 wherein the plurality of package layers are attached with solder balls.

16. The radiation shielding integrated circuit device of claim 12 wherein the radiation shielding lid is a high Z material.

17. The radiation shielding integrated circuit device of claim 12 wherein the radiation shielding base is a high Z material.

18. The radiation shielding integrated circuit device of claim 12 wherein the radiation shielding base acts as a heat sink.

19. The radiation shielding integrated circuit device of claim 12 wherein the plurality of package layers are hermetically sealed.

20. The radiation shielding integrated circuit device of claim 12 wherein the radiation shielding lid comprises a high Z material and a low Z material.

21. The radiation shielding integrated circuit device of claim 12 wherein the radiation shielding base comprises a high Z material and a low Z material.

22. A method of shielding an integrated circuit device comprising:

forming a first package layer comprising a first radiation shielding base, a first package and a first circuit die;

forming a second package layer comprising a second radiation shielding base, a second package and a second circuit die;

coupling a bottom of the first package layer to a top of the second package layer; and

coupling a lid to the first package layer.

23. The method of shielding the integrated circuit device of claim 22 further comprising forming the lid from a high Z material.

24. The method of shielding the integrated circuit device of claim 22 further comprising forming the first radiation shielding base and the second radiation shielding base from a high Z material.

25. The method of shielding the integrated circuit device of claim 22 wherein the first circuit die receives an amount of radiation less than the total dose tolerance of the first circuit die.

26. The method of shielding the integrated circuit device of claim 22 wherein the second circuit die receives an amount of radiation less than the total dose tolerance of the second circuit die.

27. A high density circuit package comprising:

a plurality of package layers comprising:

a circuit package;

a thermally conductive base coupled to the circuit package; and

a circuit die coupled to the thermally conductive base;

wherein the circuit die is coupled to the thermally conductive base through a thermal via.

28. The circuit package of claim 27 further comprising a thermal layer connector coupled to the thermally conductive base.

29. The circuit package of claim 28 wherein the circuit die comprises memory.

30. The circuit package of claim 27 wherein the thermally conductive base comprises a radiation shielding material.

31. The circuit package of claim 30 wherein the circuit die is shielded from receiving an amount of radiation greater than the total dose tolerance of the circuit die.

32. The circuit package of claim 27 further comprising a thermally conductive lid coupled to the top of the plurality of layers.

33. The circuit package of claim 27 wherein the circuit package comprises a ceramic.

34. A method of shielding an integrated circuit device comprising:

forming a first package layer comprising a first radiation shielding lid, a first package and a first circuit die;

forming a second package layer comprising a second radiation shielding lid, a second package and a second circuit die;

coupling a top of the first package layer to a bottom of the second package layer; and

coupling a base to the first package layer.

35. The method of shielding the integrated circuit device of claim 34 further comprising forming the base from a high Z material.

36. The method of shielding the integrated circuit device of claim 34 further comprising forming the first radiation shielding lid and the second radiation shielding lid from a high Z material.

37. The method of shielding the integrated circuit device of claim 34 wherein the first circuit die receives an amount of radiation less than the total dose tolerance of the first circuit die.

38. The method of shielding the integrated circuit device of claim 34 wherein the second circuit die receives an amount of radiation less than the total dose tolerance of the second circuit die.

39. A method of making a highly reliable package that protects a plurality of integrated circuit die within

different layers of the package from radiation comprising the steps of:

placing a first circuit die within a first layer of the package;

providing a lid for the first layer of the package sufficient to shield the first circuit die from receiving through the lid an amount of radiation greater than the total dose tolerance of the first circuit die;

placing a second circuit die within an inner layer of the package; and

providing an inner shielding layer for the inner package such that the lid and the inner shielding layer shield are sufficient to shield the second circuit die from receiving through the lid and inner shielding layer an amount of radiation greater than the total dose tolerance of the second circuit die.

40. The method of claim 39 wherein the first circuit die has a total dose tolerance greater than the total dose tolerance of the second circuit die.

41. The method of claim 39 further comprising placing a base on the package.

42. A method of making a high density circuit package comprising:

forming a plurality of package layers comprising:

a circuit package;

a thermally conductive base coupled to the circuit package; and

a circuit die coupled to the thermally conductive base;

coupling the circuit die to the thermally conductive base through a thermal via.

43. The method of claim 42 further comprising coupling a thermally conductive lid ~~the~~ to one of the plurality of package layers.

44. The method of claim 42 wherein the circuit die is a memory.

45. The method of claim 42 further comprising forming the thermally conductive base from copper-tungsten.

46. A method of making a high density circuit package comprising:

coupling a thermally conductive base to a first package layer;

coupling a first circuit die to the thermally conductive base;

coupling a second package layer to the first package layer; and

coupling a second circuit die to the thermally conductive base;

47. The method of claim 46 further comprising coupling a thermally conductive layer between the first package layer and the second package layer.

48. The method of claim 47 further comprising coupling the thermally conductive layer to the thermally conductive base with a thermal via.

49. The method of claim 47 further comprising coupling a thermally conductive lid to the second package layer.

50. The method of claim 49 further comprising coupling the thermally conductive lid to the thermally conductive layer with a thermal via.